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ABSTRACT

This teacher's guide presents teaching suggestions and presentation materials about the complex connections among population growth, economic activity, and changes in the environment. The lesson is divided into five parts and may be completed in one or more class periods. Student handouts include: (1) "Facts about Population, Poverty, and Land Degradation"; and (2) "Causes of Soil Degradation." Transparency masters are titled: (1) "Trends and Projections in World Population Growth, 1750-2050"; (2) "Soil Degradation as a Percent of Vegetated Land, 1945-90"; (3) "Projected Population of the World , 1990-2150"; and (4) "Energy Consumption Per Capita in Six Countries, 1991." (EH)

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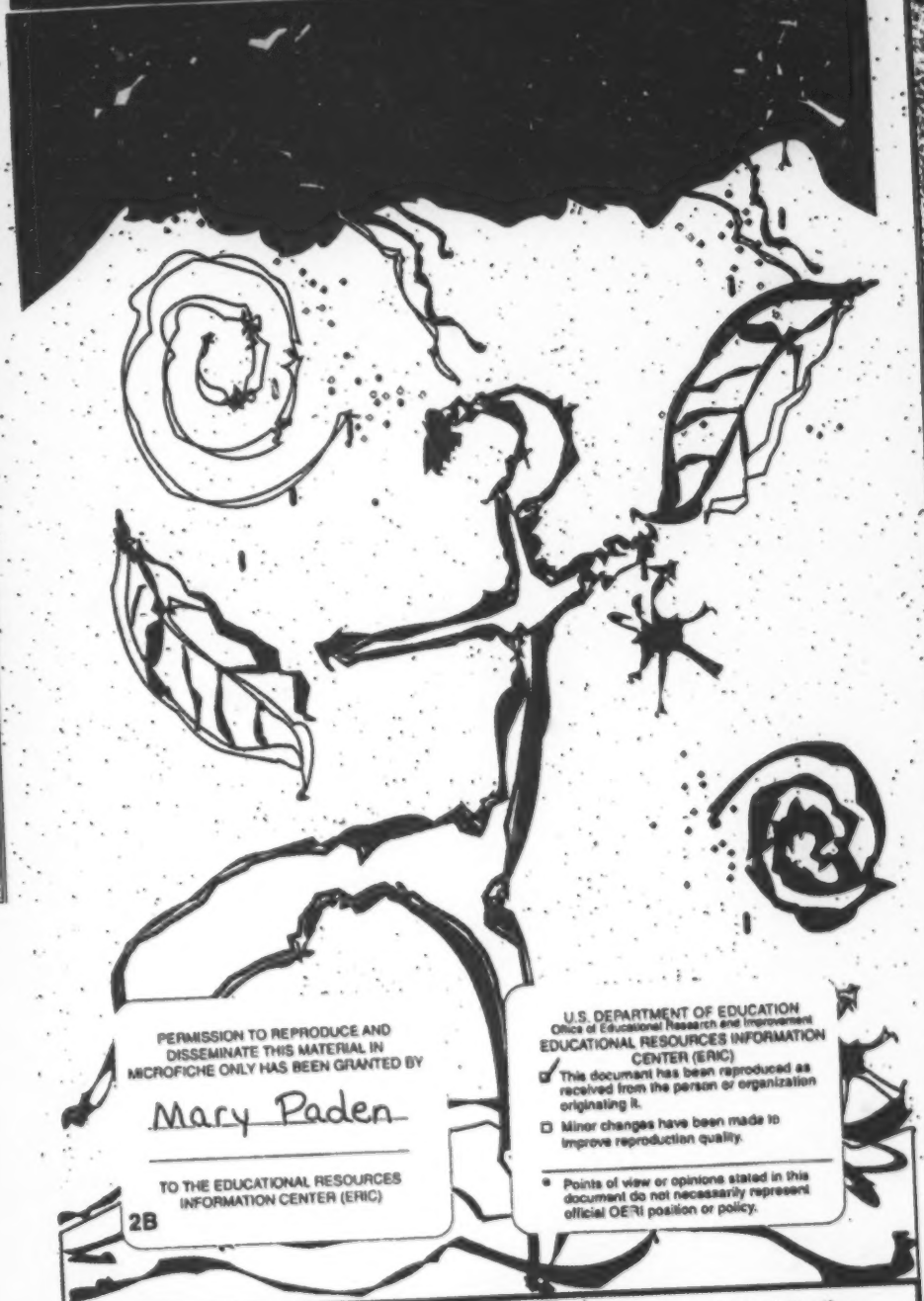
TEACHER'S GUIDE

to World Resources

Population, Poverty, and Land Degradation



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World Resources:

Population, Poverty, and Land Degradation

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Teacher's Guide

to

World Resources:

Population, Poverty, and Land Degradation

Comprehensive Coursework on the Global Environment

World Resources Institute
1709 New York Avenue, N.W., Washington, DC 20006

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The World Resources Institute (WRI) is a research and policy institute helping governments, the private sector, environmental and development organizations, and others address a fundamental question: How can societies meet human needs and nurture economic growth while preserving the natural resources and environmental integrity that make prosperity possible?

Through its policy studies, WRI aims to generate accurate information about global resources and environmental conditions, analyze emerging issues, and develop creative yet workable policy responses. In seeking to deepen public understanding, it publishes a variety of books, reports, and papers; undertakes briefings, seminars, and conferences; and offers material for use in educational settings and in the news media.

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Using World Resources Teacher's Guide Units

World Resources *Teacher's Guide* Units are designed for use at the secondary school level (although we have reports of successful use at the middle school and college levels). They weave together lessons about both environment and development, both globally and locally. They draw on skills and knowledge from the physical and biological sciences, social studies, history, economics, civics, and global studies.

Information and analysis used in the Units are drawn from World Resources Institute (WRI) publications and databases. All units are written by curricula writers and reviewed by educators as well as by technical experts. The Units are updated and revised periodically based on feedback from classroom teachers who have used the materials.

Our intent is to provide easy-to-use, inexpensive classroom materials that contain the most recent and authoritative information on the global environment because we believe it is crucial that the next generation of leaders and citizens understand the issues described here.

The complete set of *Teacher's Guide* Units includes the following topics:

- Biodiversity
- Car Trouble
- Citizen Action
- Energy, Atmosphere, and Climate
- Natural Resource Economics
- Oceans and Coasts
- Population, Poverty, and Land Degradation
- Sustainable Development
- Two Giants: China and India
- Watershed Pollution
- Women, Equity, and Sustainable Development

These units have been revised and updated with the most recent data available as of spring 1994.

Inside Each Unit

Each *Teacher's Guide* Unit should contain enough teaching suggestions and presentation materials to teach one to several classes on the topic without securing additional resources. On the other hand, each unit is designed to point teachers and students to additional resources and to offer suggestions for expanded coursework. Specifically, each unit contains objectives, a lesson plan, student handouts, overhead transparency masters, student enrichment activities, suggestions for further reading, and suggested audiovisual resources.

Using the Units for Environmental Studies

The *Teacher's Guide* Units provide a comprehensive, consistent yet highly flexible set of materials for environmental studies courses. They can be used in conjunction with an environmental science textbook to give students an understanding of basic environmental systems and cycles. Or they can be used in a social studies context to examine some of the tough problems and choices we face as a society.

Educators who want to go beyond the *Teacher's Guide* Units can read related WRI publications, which provide the basic data, source materials, and analysis for the Units. These publications are listed at the beginning of each unit. A free catalog can be obtained by calling 1-800-822-0504.

Integrating Teacher's Guide Units into the Curriculum

Secondary school teachers frequently mention the difficulty of integrating environmental issues into a tightly packed curriculum. As much as they would like to teach about the environment, they must devote class time to required subjects.

To help them place these issues in their curricula, we have coded each lesson plan and each student enrichment activity to the draft national performance assessment standards for science, math, history, civics, and geography. These standards are being developed as part of the national Goals 2000 program in the U.S. Department of Education. The standards themselves are being developed, discussed, and revised by educational organizations in nine academic disciplines. They are expected to be approved at the national level, then offered to states to incorporate into their own academic assessment plans. Although this process will take several years, we have compiled lists of assessment standards for grades 9 through 12 from drafts available in spring 1994 to offer some guidance to teachers.

A complete list of the draft standards for Grades 9 through 12 appears in Appendix B, which should be mailed to you with your order. Appendix A provides a bibliography and list of related organizations.

Integrating Global Environmental Education into High School Curricula

In an effort to link lessons about global environment and development issues to required school curricula, we have identified which pages of the lesson plan and which student enrichment activities in this *Teacher's Guide* Unit relate to the draft national performance standards developed recently for civics, geography, history, math, and science in grades 9 through 12.

These voluntary national standards are part of the Goals 2000 program mandated by the Goals 2000: Educate America Act of 1994 under the direction of the U.S. Department of Education. Among other things, Goals 2000 will establish a set of goals or performance standards for grades 4, 8, and 12 in the subjects listed above plus English, the arts, and foreign languages. These goals will be available to the states for incorporation into their own sets of educational performance standards. Each set of draft standards was developed by a professional education organization and has been presented at numerous educational conferences for review and comment. The draft standards used here are those available as of spring 1994.

Although many countries have national performance standards, the United States (and Canada) have treasured a decentralized educational system that sets education goals at the district or state level. Goals 2000 is the first attempt to identify a set of general education objectives that all students in the country are expected to achieve. As might be expected, there is some controversy over whether there should be national education goals—even voluntary ones—and if so, what they should be.

Regardless of the final outcome, we feel the draft goals do reflect some consensus among educators about what material should be covered at various grade levels, and as such, offer some guidance for integrating environmental education into the curricula.

Only those goals relevant to this unit are listed here. A complete list of goals appears in the 1994 *Teacher's Guide to World Resources*. Copies of reports outlining the goals for each subject area can be obtained from the education organizations listed at the top of each set of goals on this page. Information about the Goals 2000 program is available at 1-800-USA-LEARN.

Goals 2000: Draft National Performance Standards

Civics and Government*

(Draft National Standards, October 1993, Center for Civic Education, 5146 Douglas Fir Road, Calabasas, CA 91302-1467)

	Lesson Plan	Enrichment Activity
III. How Does the Government Established by the Constitution Embody the Principles and Purposes of American Democracy?		
3. How are state and local governments organized, what do they do, and how can they be influenced?		4
5. How does the American political system provide for choice and opportunities for participation?		4
6. How is public policy formulated and carried out?		4
V. What are the Roles of the Citizen in the American Political System?		
4. How can citizens participate in public life?		4

Note: Only the education goals relevant to this unit are listed.

History*

(Draft National Standards, October 1993, National Center for History in the Schools at UCLA, 231 Moore Hall, 405 Hilgard Avenue, Los Angeles, CA 90024)

	Lesson Plan	Enrichment Activity
I. Historical Chronology		
1. Distinguish between past, present, and future time.	1, 2	1, 4
8. Reconstruct patterns of historical succession and duration and apply them in explaining historical continuity and change.		1
III. Historical Interpretation		
4. Consider multiple perspectives in the records of human experience, by demonstrating in what ways the differing, motives, beliefs, interests, hopes, and fears people brought to the issue influenced their behaviors.		1, 2
IV. Historical Analysis		
1. Compare and contrast differing sets of ideas, values, personalities, institutions, etc. by identifying likenesses and differences.		2
4. Demonstrate and explain the influence of ideas, human interests, beliefs and ideologies on individual and group historical actions and their consequences.		2

5. Hypothesize the influence of the past on the present.		4
V. Historical Research		
2. Obtain needed historical data from a variety of sources including: library and museum collections, historic sites, historical photos, journals, diaries, eyewitness accounts, newspapers, and the like; documentary films; and so on.		4
4. Identify the gaps in the available records and marshall contextual knowledge and perspective of the time and place.		1

Geography*

(Draft National Standards, October, 1993, National Council of Geographic Education, Geography Standards Project, 1600 M Street, NW, Washington, DC 20036)

	Lesson Plan	Enrichment Activity
I. Seeing the World in Spatial Terms		
1. Knows and understands how to use maps, globes, and other graphic tools and technologies to acquire, process, and report information from a spatial perspective.	1-4, 6, 7	2, 4
II. Elements: Places and Regions		
4. Knows and understands the physical and human characteristics of place.		4
IV. Human Systems		
9. Knows and understands the characteristics, distribution, and migration of human populations on Earth's surface.		4
11. Knows and understands patterns and networks of economic interdependence on Earth's surface.	7, 8	4
12. Knows and understands the processes, patterns, and functions of human settlement.	1-4, 6, 8	2, 4
V. Environment and Society		
14. Knows how Earth's dynamic physical and human systems are connected and interact.	1-8	4
15. Knows the consequences of the interaction between dynamic human and physical systems.	1-8	4
16. Knows changes in the meaning, distribution, and importance of resources.	1-8	4
VI. Applying Geography		
18. Knows and understands how to apply geography to interpret the present and plan for the future.	7, 8	2, 4

Mathematics*

(Draft National Standards, March 1989, The National Council of Teachers of Mathematics, Order Processing, 1906 Association Drive, Reston, VA 22091)

	Lesson Plan	Enrichment Activity
I. Mathematics as Problem Solving		
4. Apply the process of mathematical modeling to real-world problem situations.	1, 3, 6	2, 3
VI. Functions		
1. Model real-world phenomena with a variety of functions.	1, 2, 6	3
X. Statistics		
1. Construct and draw inferences from charts, tables, and graphs at summarize data from real-world situations.	1, 2	3

Science*

(Draft National Standards, February 1994, National Academy of Sciences, National Research Council, 2101 Constitution Avenue, NW, Washington, DC 20418)

	Lesson Plan	Enrichment Activity
III. Life Science		
3. Genetics and Molecular Biology		3
4. Ecosystems and Human Ecology	1-8	2-5
V. Unifying Concepts And Processes Of Science		
2. Conservation		5
VII. Science and Societal Challenges		
1. Population Growth	1-4, 6-9	1-5
2. Natural Resources	1-9	1-5
3. Environmental Degradation	1, 3-9	4-5
4. Natural and Human-Induced Hazards		4-5
5. Community Health	1-3	1-3
6. Global Change	1-4, 8, 9	
VIiI. History/Nature of Science		
3. Science/Society		2, 3

Population, Poverty, and Land Degradation

No one can see into the future, although today's predictions are more likely to come from a computer than a crystal ball. But population projections show that we are in the midst of a period of rapid population growth. The world's population doubled between 1950 and 1990, and will more than double again before it stabilizes. This lesson examines some of the complex connections between population growth, economic activity, and changes in the environment.

Source material for this unit can be found in *World Resources 1992–93* and *World Resources 1994–95*. Other source materials from the World Resources Institute are recommended in "Suggestions for Further Reading" and at the end of the unit.

Objectives

By the time they finish this lesson, students should be able to:

- Identify and describe current trends of population growth in both industrialized and developing nations.
- Describe projections for future population growth.
- Identify factors that influence and can be used to predict population growth.
- Explain why certain countries are labeled as "poor" or developing countries and others are labeled as "rich" or industrialized countries.
- Define the term "land degradation" and give examples.
- Communicate how population growth, poverty, and land degradation are interrelated.
- Communicate why it is important to develop and implement policies to promote sustainable development in both industrialized and developing countries.

Teaching Strategies

This lesson is divided into five parts. Allow one class period if you wish to give an overview of the topics, and more if you wish to cover the topics in detail and include activities. The lesson includes the following materials that may be duplicated.

Student Handouts:

1 Facts about Population, Poverty, and Land Degradation
2 Causes of Soil Degradation

Overhead Transparency Masters:

1 Trends and Projections in World Population Growth, 1750–2050
2 Soil Degradation as a Percent of Vegetated Land, 1945–90
3 Projected Population of the World, 1990–2150
4 Energy Consumption Per Capita in Six Countries, 1991

Beginning the Lesson

Distribute copies of **Handout 1, "Facts about Population, Poverty, and Land Degradation."** Allow students a few minutes to quickly read the handout.

On the chalkboard, write the three main areas covered in this chapter: *Population, Poverty, Land Degradation.*

Explain that during this lesson, students will be examining how the rapid growth of the world's population is affecting both humans and their environment.

Show a transparency made from **Overhead Transparency Master 1, "Trends and Projections in World Population Growth, 1750–2050."** Use the following questions for discussion:

How is population measured? Population figures are estimates based on population censuses and surveys. The accuracy of these censuses and surveys varies. The figures used here are from the United Nations Population Division, which compiles and evaluates information from all countries. For an explanation of some of the terms used, see **"Talking About Population,"** in **Handout 1**.

When did the world's population begin to increase rapidly? During the second half of the 20th Century.

What caused this population increase? Before 1950, population growth rates overall were lower because the number of deaths and births were more nearly in balance. Birth rates were high, but so were death rates. As better health care, sanitation, and education were introduced in the already populous developing countries, the death rate fell but the birth rate remained high, reflecting traditional cultural norms, values, and attitudes. When the population reached 3 billion in 1960, it had taken more than 100 years to double. But experts predict it will take less than 40 years to double again: from 3 billion in 1960 to a projected 6 billion in 1998.

Where is most of the population increase expected to take place? In the developing countries of the world, especially in Africa, where the population is projected to nearly triple, from 642 million in 1990 to 1.6

billion in 2025. Africa has a rapid growth rate but a smaller population when compared to Asia and Latin America.

Why is this increase taking place in the developing countries? In these countries, the populations are young. Each year, there are increasing numbers of young women of childbearing age.

What other factors besides the number of women of childbearing age influence the birth rate in developing countries? Traditional cultural norms, values, and attitudes favor large families. Factors that appear to decrease fertility include: education and employment for women, urbanization, economic development of the country, and the availability of health care and access to family planning.

The average fertility rates of developing countries have declined steadily over the past 20 years. However, because of the large number of young people, the population will continue to grow rapidly until it begins to level off around 2050.

As countries develop economically, they go through a process called demographic transition in which living standards are raised, child mortality is reduced, and fertility declines. Policies that promote education, health care, and the use of contraceptives work to speed up this transition. (Use **Activity 1, "Research Family History,"** and **Activity 2, "How Many Children?"** to help students analyze factors that influence birth rates.)

Examining Poverty

To discuss poverty, begin with the following questions. In developing answers to these questions, draw on the information below and the suggested references.

How is poverty measured and where does it exist? Poverty exists in every country in the world—and it is growing.

Industrialized countries. Problems of poverty have worsened in the industrialized countries in the past 10 years. In the past, economic growth had reduced poverty. But in the 1980s, rapid technological change and the increasing globalization of trade and production introduced structural changes in national economies that reduced job security, especially for workers with low skill levels.

Poverty, for an individual or family, is measured in terms of annual income. In the United States, 13.5 percent of the population has an annual income below the official poverty line; 14.4 percent in Canada. In all industrialized countries, certain groups are especially vulnerable to poverty: young people, single-parent households, and members of ethnic minorities. In 1990, 20.6 percent of U.S. children lived in poverty, up 1 percent over 1989, according to the U.S. Census Bureau.

Developing countries. Most of the world's poor live in developing countries where the population is increasing rapidly. Thus, there are more and more people who need food, shelter, health care, and education.

Just as individuals and families can be ranked according to their income, so countries are ranked. The World Bank uses a ranking system based on the gross national product (GNP) of a country divided by its population, or per capita gross national product. With this system, there were 40 "poor" countries with an average annual per capita GNP of less than US$350 in 1991. Most of these countries are in Africa. A few are in Asia, and there is one (Haiti) in the Caribbean and two (Nicaragua and Guyana) in Latin America. Some of the poorest nations are Mozambique (US$80), Tanzania (US$100), Ethiopia (US$120) and Nepal (US$180).

The gap between these poorest nations and the richest is huge: the United States has an average per capita GNP of US$22,240. Others are even richer: Switzerland (US$33,610), Japan (US$26,930), and Sweden (US$25,110).

In 1990, the United Nations Development Programme (UNDP) proposed a new method of classifying countries, the Human Development Index (HDI). In addition to per capita GNP, this index considers the quality of life as reflected in the education and health of people. The index uses the specific measurements of life expectancy (to indicate health) and adult literacy (to indicate educational level). With this new index, 63 countries are ranked low in human development. The group includes most of the low-income countries and 25 additional countries in North and sub-Saharan Africa, South and Central America, and the Middle East.

The index reflects the fact that the poor lack access to education and health care. Many are homeless, hungry, or malnourished. Many do not have safe drinking water. When young children don't have enough to eat, they are more susceptible to disease and their physical and mental development is affected, limiting their ability to learn and live productive lives. A hopeful sign in the HDI is that several countries with a low GNP per capita ranked high in human development because they had policies that promoted health care and education for their people.

Why is it difficult for countries to meet the human development needs of their populations? The governments of all countries have to set priorities and make decisions about how to spend their resources. The same is true, of course, for states, cities, and counties. It takes money to build and operate schools, hospitals, and health clinics, etc. Encourage students to discuss this issue in terms of their own city or county budget—for example, what cutbacks are being made in funding for schools, libraries, health clinics, and other social programs.

In developing countries, the human development needs are much greater and the resources to address these needs are much smaller. Over the past ten years, many developing countries have experienced a serious economic slowdown. Countries that export commodities such as sugar, rice, and coffee have seen prices of these commodities fall, while, during the 1970s and early 1980s, they had to pay much higher prices to import oil.

Many countries borrowed heavily to make ends meet and to establish development programs. However, by 1990, many countries, especially in Latin America and Africa, were deeply in debt and had to spend a large percentage of their national income just to pay the interest on their loans. Thus, during a period when they should have been expanding health and urban services for their growing populations, many countries have been unable even to maintain the same level of services per capita that they offered in 1980. In some countries, government funds have been drained by excessive military expenditures and by corruption.

Examining Land Degradation

Just as the world's population is increasing and poverty is increasing, so is environmental degradation. To illustrate this, examine one type of degradation: land degradation (loss of the land's biological productivity). Human activities cause land to become degraded.

How is soil degradation measured? It is difficult to measure the degree and extent of global soil degradation. It can't be done by satellite photography. It must be done by examining the soil. Signs of degradation are (1) soil erosion, (2) loss of soil's productive capacity (as measured by chemical changes in the soil), and (3) the appearance of certain types of plants (for example, salt-tolerant plants may indicate the presence of salt in the soil).

What causes soil degradation? Distribute copies of **Handout 2, "Causes of Soil Degradation,"** and ask students to compare and contrast the different regions. Look at the differences between the industrialized countries of North America and Europe and the developing countries of Africa, Central and South America, and Asia. [Note: Oceania contains both developed countries (Australia and New Zealand) and developing (Fiji, Papua New Guinea, and the Solomon Islands)].

Why should we be concerned about soil degradation? Show a transparency made from **Overhead Transparency Master 2, "Soil Degradation as a Percent of Vegetated Land, 1945–90."**

- The term "vegetated land" refers to land on which plants grow, whether naturally (for example, in rainforests) or cultivated by people. It does not include deserts, dunes, ice caps, rock outcrops, arid mountain regions, and salt flats.
- The graph shows areas where soil has lost some of its productive capacity and requires efforts beyond the means of the average farmer to be restored.
- The graph expresses land degradation in percentages. For example, it shows that 24 percent of the vegetated land of Central America and Mexico became degraded between 1945 and 1990.
- Figures in the graph are based on estimates by 250 soil scientists around the world.

Reasons for concern include the following:

- The amount of land that has become degraded during a period of only 45 years is significant: an area larger than India and China together, representing 11 percent of the Earth's vegetated surface.
- A larger percentage of the Earth's land is degraded than is shown in the graph. The graph does not show soils degraded before 1945 or land that is naturally barren.
- Productive land is becoming degraded. For example, the soils of North America's breadbasket—some of the world's most fertile—show moderate degradation from wind and water erosion. They require more fertilizers and high-yielding crop varieties to sustain outputs.
- It is difficult and expensive, and in many cases impossible, to restore degraded land.
- Degradation is a process that lowers the current and/or future capacity of the soil to support human life.
- As the world's population grows, the amount of productive land per capita is shrinking. Forests, farmlands, and grasslands are our life support system.

Looking Ahead: What Will the Future Hold?

How fast will the world's population increase? No one knows for sure, but the United Nations tries to guess what lies ahead. Its long-range population projections influence thinking and planning around the world.

Show a transparency made from **Overhead Transparency Master 3, "Projected Population of the World, 1990–2150."** This graph shows five different estimates or projections, based on different fertility rates (the fertility rate is the average number of children women bear in their lifetime). It is interesting to note that this U.N. projection made in late 1991 shows a "medium" projection for 2150 that is 1 billion (10 percent) higher than that calculated by the U.N. in 1982.

Point out that there are significant differences among the projections:

- If fertility stabilizes at 2.5 children, world population would reach 28 billion in 2150, the "worst case" scenario. (Shown in the graph as "High.")
- If fertility stabilizes at 2.17 children (5 percent higher than the replacement level), the population would be nearly 21 billion by 2150. ("Medium-high.")
- If fertility stabilizes at the replacement level (2.06), global population will ultimately stabilize at 11.6 billion just after 2200. ("Medium.")
- If fertility stabilizes at 5 percent below the replacement level, population would peak at 7.8 billion in 2050 and then fall to 5.6 billion by 2150. ("Medium-low.")
- If the fertility rate were even lower (1.7 children), the population would peak at 7.8 billion in 2050 and then fall to 4.3 billion 100 years later. ("Low.")

How Will Population Growth Affect the Environment?

One way to address this question is to consider consumption of resources. It matters not only how many people are added to the population but how and where they live. Industrialized countries have a higher standard of living; their citizens consume more of the planet's resources, including the majority of minerals and fossil fuels.

Overhead Master 4, "Energy Consumption Per Capita in Six Countries," compares the amount of energy used on the average by each person in six selected countries: the United States, Germany, Japan, Brazil, Congo, and India. It tells two stories. First, by comparing the first three countries—all industrialized—to the last three—all developing, one can easily see the dramatic difference in energy use by people in the industrialized and developing world. An average U.S. citizen uses 23 times as much energy as an average Indian citizen.

Second, note that the energy use per capita is quite different among the three industrialized countries, all of which have a similar standard of living. These comparative data show that a high standard of living is possible with much less (about half in the case of Japan) energy use than in the United States. (Note: **Activity, 3, "Keep an Energy Diary,"** can be used to help students examine their own energy consumption.)

Students might like to debate the following question: *Is the United States the world's most overpopulated nation, considering the consumption patterns of its residents?*

The following equation can be used to discuss how population growth and consumption affect the environment:

population size × *unit of resources consumed per capita*
× *environmental impact per unit* = *kinds and levels of environmental impact*

Using this formula, there are various possibilities:

- Population size/growth is small and per capita consumption/impact is high. This is the case with industrialized nations where there are high levels of certain kinds of environmental impacts such as acid rain, toxic wastes, solid waste, urban/suburban sprawl, and changes in land use patterns.
- Population size/growth is large and per capita consumption/impact is low, as in the developing nations. In this situation, there are different kinds of environmental impacts (deforestation, overgrazing, etc.).

There are also common problems in both cases, such as air and water pollution and habitat destruction. The worst long-term environmental impact is to have a large increase in both population and consumption.

Consumption in industrialized countries also affects the natural resources of developing countries. The demand for tropical hardwoods in industrial countries, especially Japan, has led to extensive and often destructive cutting of forests in Southeast Asia. In the United States, consumer demand for parrots and other tropical birds as pets has put pressure on the wild populations in several countries.

Consumption in industrialized countries also affects the global environment, leading to air and water pollution, the buildup of CO_2 and other greenhouse gases, and depletion of the ozone layer.

How Many People Can the Earth Hold?

No one knows what the "carrying capacity" of the Earth is, but one thing is certain: the Earth's resources are finite. Where resources are finite, there is a maximum population that these resources can support. Unlike animals, humans may, through technology, extend the Earth's carrying capacity—but not indefinitely.

In February 1992, the officers of the U.S. National Academy of Sciences and the Royal Society of London issued a joint statement urging scientists to examine the critical connection between population growth and degradation of the global environment (U.S. National Academy of Sciences and the Royal Society of London, *Population Growth, Resource Consumption, and a Sustainable World*). The statement explains that, "if current predictions of population growth prove accurate and patterns of human activity on the planet remain unchanged, science and technology may not be able to prevent either irreversible degradation of the environment or continued poverty for much of the world."

This statement says that scientific research and technological innovation can help, but cannot, by themselves, solve problems created by rapid population growth, wasteful resource consumption, and harmful human practices. Scientists can help by: developing new, safe, and effective contraceptive devices; developing alternative energy sources; improving agricultural production and food processing; studying plant and animal genetic varieties and biotechnology relating to plants, animals, and preserving the environment; developing effective drugs and vaccines for malaria, hepatitis, AIDS, and other infectious diseases. Areas that merit research are: improved land-use practices, ways of protecting watersheds and groundwater, new technologies for waste disposal and pollution control, new materials that reduce pollution and the use of hazardous substances.

Concluding the Lesson

It is important to emphasize that no one knows exactly what will happen. There's no reason to think that the future is all "gloom and doom," or that nothing can be done to curb population growth, promote human development, and conserve natural resources.

In the wake of the 1992 United Nations Conference on Environment and Development, the United Nations is hosting several major international conferences over the next few years regarding population and social development. They include: the UN Conference on Population and Development in Cairo, Egypt in September 1994; the World Summit for Social Develoment in Copenhagen, Denmark in March 1995; and the Fourth World Conference on Women in Bejing, China in September 1995.

17

These conferences and the preparatory meetings leading up to them provide a forum for international discussion of these issues and the possibility of the formation of new concepts, policies, and commitments. Have students watch for news about these conferences and discuss issues they raise.

According to the National Academy of Sciences/Royal Society of London statement, the next 30 years may be critical to the future of the planet. Ask students to generate a list of priorities for the next 30 years. What needs to be done? What are some ways of achieving these goals? What are they willing to do in the next 30 years—in their personal lives as consumers and citizens, and in their work lives—beginning right now. What might they do in the areas of conservation, recycling, substitution and efficient use of energy?

Suggestions for Further Reading

- Nathan Aaseng, *Over-Population* (Franklin Watts, New York, 1991).
- Paul and Anne Ehrlich, *The Population Explosion* (Simon and Schuster, New York, 1990).
- Jodi L. Jacobson, "China's Baby Budget," in *The Worldwatch Reader on Global Environmental Issues*, Lester R. Brown, ed. (W. W. Norton, New York, 1991).
- Idriss Jazairy, et al., *The State of the World's Rural Poverty: An Inquiry into its Causes and Consequences* (New York University, 1992).
- Carrie A. Meyer, et al., *Population Growth, Poverty, and Environmental Stress: Frontier Mitigation in the Philippines and Costa Rica* (World Resources Institute, Washington, D.C., 1992).
- Population Reference Bureau, *Population Today*, a monthly newsletter, and other materials put out by Population Reference Bureau, Inc., 1875 Connecticut Ave., N. W., Suite 520, Washington, D.C. 20009-5728.
- Gareth Porter and Delfin J. Ganapin, Jr., *Resources, Population, and the Philippines's Future: A Case Study* (World Resources Institute, Washington, D.C., 1988).
- Robert Repetto, *Population, Resources, Environment: An Uncertain Future* (Population Reference Bureau, Washington, D.C., 1987).
- United Nations Development Program, *Human Development Report 1992* (Oxford University Press, New York, 1992).
- See also materials from Zero Population Growth, 1400 16th St., N.W., Washington, D.C. 20036.

1 Research Family History

In the industrialized countries, the average number of children per family has been declining over the past 100 years. Students could study their own family histories to see if this general trend is evident. Information can be gathered by talking to family members and looking at family papers and photographs. Students should record their findings by making a diagram or family tree, starting with themselves and their siblings, then working backward by showing how many siblings each parent had, then how many siblings each grandparent had, etc. Can students find out anything about factors that influence family size (values, health, economic status, religious beliefs, historical events such as wars, etc.)?

Skills emphasis:* *Hist I 1, I 8, III 4, V 4; Science VII 1–2, VII 5*

Suggested for use in: *Social Studies, History, Environmental Issues.*

2 How Many Children?

China and Japan are two Asian countries with contrasting attitudes toward population growth. Japan, a highly industrialized island country, has always been concerned with population growth. However, it now has a rapidly aging population (in 1989, almost 17 percent of the population was over age 60) and a lower birth rate. Projections show that by 2020, Japan's population could be declining. While there is no official policy to encourage large families, Japan tries to improve conditions for young couples who wish to have children by offering better housing, longer maternity leave, nurseries, etc.

China, on the other hand, with a large population spread over a vast area and with a reasonable age distribution (8 percent over age 60), is trying to develop its economy and raise the standard of living for its people. China has sought to restrict population growth to accomplish this. The government has adopted a policy of one child per family with incentives and disincentives to persuade couples to limit family size.

For this activity, have students do research on marriage and family life in Japan and China. One good source is Deborah Fallows, "Japanese Women," *National Geographic* (April 1990), pp. 52–83. What are some of the factors that influence a couple's decision to have children (income, housing, opportunities for women). Following research, students could do role playing, becoming Japanese and Chinese couples making decisions about family size. Do students want to have children? How many children? Why? [Under **"Audiovisual Resources,"** see information on the film, "China's Only Child." Other resources include: United Nations Department of International Economic and Social Affairs, *World Population Policies*, Vols. 1 and 2, (United Nations, New York, 1989).]

Skills emphasis: *Hist III 4, IV 1, IV 4; Geo I 1, IV 12, VI 18; Math I 4; Science III 4, VII 1–3, VII 5, VIII 3*

Suggested for use in: *Social Studies, Environmental Issues, Geography.*

3 Learn about Childhood Causes of Death

In late 1991, the U. S. Census Bureau estimated that more than 20 percent of the country's children live in poverty. Poverty often means a lack of access to quality health care. The U.S. infant mortality rate (8.9 per 1,000 live births) is higher than that of about 20 other industrialized countries. Canada's infant mortality rate is 7 per 1,000 live births. Have students investigate infant mortality rates in their area by contacting hospitals or local health officials. Find out the most common causes of death and compare the data with national averages from several countries.

Skills emphasis: *Math I 4, VI 1, X 1; Science III 3–4, VII 1–2, VII 5, VIII 3*

Suggested for use in: *Social Studies, Health, Geography, Biology, History.*

4 Study Local Population Changes and Land Use

While the populations of most countries are increasing, in a few countries, the population is actually declining. Similarly, in the United States, the population is shifting from the northeast and midwest to the south and west, according to the 1990 Census. (One mid-western town recently ran a successful national advertising campaign to attract new residents.) How has your city, town, or county changed in population since 1950? If possible, look at area maps. Compare a map from 1950 with a current map. How has land use changed? How have population changes affected the environment? Has farm land been converted to suburbs, or been reforested, either deliberately or through neglect? What changes have occurred in transportation facilities: roads, public transportation, etc.? What changes are projected for your area in the future? Is the population likely to increase rapidly? If so, how are the demands for housing, schools, roads, libraries, solid waste disposal, etc. going to be met? Are there any projects underway or proposed that are controversial (for example, a light rail system, a shopping

See chart of Draft National Performance Standards at beginning of this unit.

mall, a highway, a landfill or incinerator)? If so, students might gather information by attending public hearings, talking with government officials, reading local newspapers, etc. How might these projects affect the environment (for example, does the highway or light-rail system route impinge on existing parklands)? What is the projected cost of the project and how will the project be funded?

Skills emphasis: *Geo I 1, II 4, IV 9, IV 11–12, V 14–18; Civics III 3, III 5–6, V 4; Hist I 1, IV 5, V 2; Science III 4, VII 1–4*

Suggested for use in: *Social Studies, Environmental Issues, Earth Science, Geography.*

5 Study Environmental Restoration

In many places, scientists, helped by volunteers, are trying to undo damage done to land and bodies of water. Environmental restoration projects attempt to imitate nature by restoring productivity and diversity of animal, plant, and insect life. Many restoration projects, such as the planting of salt marshes in the Chesapeake Bay and San Francisco Bay, depend on volunteers for success. If there is a project in your area, students could visit it to observe the process, and perhaps, participate. For example, the state of Florida has voted money to begin filling in a 60-mile canal built by the Army Corps of Engineers to carry water from Lake Kissimmee to Lake Okeechobee. The goal is to divert water back into the Kissimmee River and restore the marshes along it. Two sources are—Laurence Pringle, *Restoring Our Earth* (Enslow Publishers, Inc., Hillside, N.J., 1987) and John J. Berger, *Restoring the Earth: How Americans Are Working to Renew Our Damaged Environment* (Doubleday, New York, 1987).

Skills emphasis: *Science III 4, V 2, VII 1–4*

Suggested for use in: *Biology, Ecology, Plant Science, Environmental Issues.*

Audiovisual Resources

- *China's Only Child* (1984), ¾" U-matic video cassette, 50 min. Originally broadcast in the United States on the PBS "Nova" series, *it describes the controversial one-child-family policy in the People's Republic of China.*
- *Creating Alternative Futures,* VHS, 12 programs, 30 min. each, Bullfrog Films. *Economist and Futurist Hazel Henderson hosts half-hour discussions with other well-known authors.*
- *Food for Thought,* VHS, 28 min., Bullfrog Films. *Comparing a cow to a gas-guzzling auto, science writer Roger Bingham discusses the environmental consequences of a meat-centered diet.*
- *The Fragile Mountain* (1983), VHS, 56 min., Sandra Nichols Productions, Ltd. *Shows how human activities, including farming, livestock grazing, and cutting the forest for fuelwood, have led to deforestation and erosion in the Himalayas.*
- *Growing Pains,* Turn the Tide Series (1988), VHS, 26 min., Bullfrog Films. *Why is there hunger in a world that grows more than enough food?*
- *Human Numbers, Human Needs* (1986), VHS, 19 min., Population Reference Bureau. *Discusses the pressures that human population growth places on the environment.*
- *Road to Ruin: Only One Earth* (1987), VHS, 53 min. Available from Social Studies School Service at (800) 421-4246. *This three-part program explores the causes and effects of world environmental problems examining desertification in the Sahel region of Africa, the destruction of the rainforest in Mexico, and the loss of the herring population off the coast of Scotland.*
- *The Silent Explosion* (1987), VHS, 20 min., Population Institute. *Focuses on the consequences of overpopulation on the world's environment and food supply.*
- *The Vanishing Wildlands* (1981), VHS, 13 min., The National Film Board of Canada. *A region-by-region examination of Canadian wildlands threatened by various forms of development.*
- *What is the Limit?* (1989), VHS, 23 min., National Audubon Society. Includes a discussion guide, "Where do we go from Here?" *A probing discussion of the interrelationships among human population growth, environmental degradation, resource depletion, habitat destruction, and the ethical considerations of the future.*
- *World Population* (1990), VHS and 16 mm, 6 min. Zero Population Growth. *Presents a vivid graphic simulation of human population growth. Dots are placed on a world map to represent millions of people added to the population from AD 1 to the present and projected to 2050. Historic references have been added to place population changes in context.*

Facts about Population, Poverty, and Land Degradation

State of the World's Population

- A large, unprecedented increase in the world's population is occurring. The world population doubled between 1950 and 1990 and will more than double again before it stabilizes.
- Most population growth is occurring in the developing countries of Asia, Africa, and Latin America.
- Before World War II, both birth rates and death rates were high in the developing countries. After 1945, these countries experienced a "population explosion" as death rates fell sharply, due to rapid improvements in health care and sanitation, while birth rates remained high, in accordance with traditional cultural norms, values, and attitudes.
- In 1991, 4.2 billion people (77 percent of the world's population) lived in developing countries and 1.2 billion (23 percent) lived in industrialized countries.
- In the industrialized countries, the proportions of people in each age range are roughly equal. In the developing countries, far more people are in the young age groups.
- Population growth rates are declining everywhere except Africa.
- About 43 percent of the world's people live in urban areas.

State of the World's Poor

- In 1990, the World Bank estimated that more than 1.1 billion people live in poverty, with an annual per capita income of less than US$370 a year. Of these, 630 million are "extremely poor," with an average annual per capita income of less than US$275.
- Well over 1 billion people are malnourished, including 150 million children under age five.
- About 1 billion adults cannot read and write.
- Over 1.5 billion people do not have safe drinking water, 1 billion suffer from hunger, and about 100 million people are completely homeless.
- Most of the world's poor live in the developing countries of Asia, Africa, and Latin America.
- Most of the world's poor live in rural areas.

State of the World's Lands

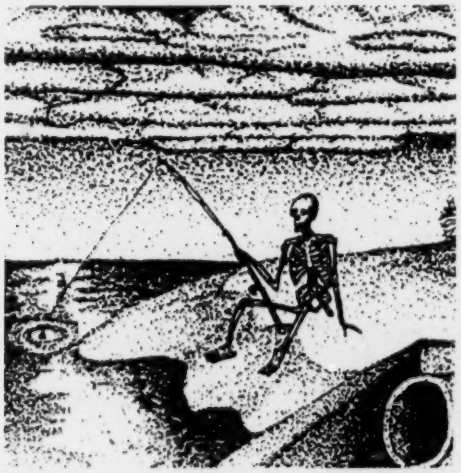
- Human activities are degrading much of the world's land surface, lowering the current and/or future capacity of the soil to support human life.
- In the past 45 years, an area about the size of China and India combined has suffered moderate to extreme soil degradation.
- Causes of soil degradation include overgrazing by livestock, agricultural practices, deforestation, overexploitation of vegetation for fuelwood, and industrialization.
- Tropical deforestation has accelerated dramatically. Asia has the highest rate, followed by Latin America, and Africa.
- Largely because of population growth, per capita cropland has declined in all regions of the world.

Trends

- Population growth will eventually return to traditional low rates. Current projections suggest that the world population will stabilize at about 11.6 billion, which would more than double the current population.
- Population growth rates vary widely. In a few countries, the population is not increasing, or is even decreasing.

Facts about Population, Poverty, and Land Degradation *(continued)*

- The percentage of the world's population living in industrialized countries is growing smaller. By 2025, 84 percent of the world's population will live in developing countries.
- In many countries, severe population pressure on marginal lands is contributing to deforestation and soil erosion. The best land for agriculture is already taken. Landless people have no alternative but to try to farm land that is not suited for farming, such as steep hillsides or forests. Slash-and-burn clearing for agriculture is a leading cause of deforestation. When fields are cut into steep hillsides, rain washes the topsoil away.
- Population growth is likely to profoundly influence every aspect of human and social development, natural resource and environmental management, and economic progress over the next 50 years, the period of most pronounced population growth.



Talking about Population

This box contains definitions of some useful terms.

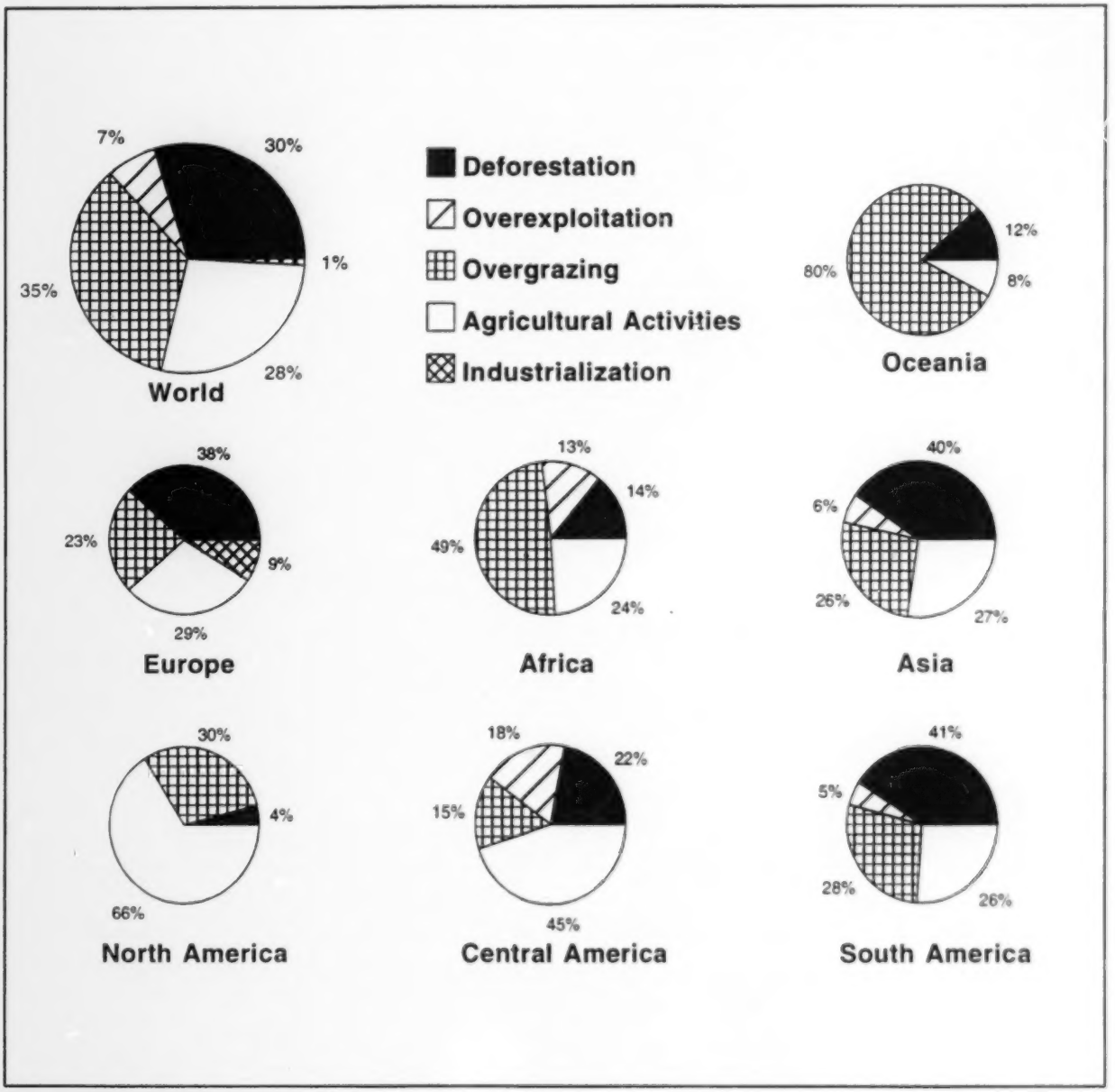
birth rate—the number of infants born alive in a given year per 1,000 people. Obtained by dividing the number of live births in a year by the population and multiplying by 1,000. For example, the projected birth rate in the United States in 1990–95 is 14.1. In Canada the projected birth rate is 12.9. The projected birth rate in Zambia for the same time period is 50.3.

death rate—the number of deaths during a given year per 1,000 people. Obtained by dividing the number of deaths in a year by the population and multiplying by 1,000. For example, the projected death rate in the United States in 1990–95 is 9. In Canada the projected death rate is 8. The projected death rate in Sierra Leone for the same time period is 22.

fertility rate—the average number of children that women are expected to bear in their lifetime based on current rates. In the United States in 1990–95, the fertility rate is estimated to be at or below 2. In Canada, the fertility rate is estimated at 1.7. The fertility rate in Rwanda for the same period is estimated to be 8.

population growth rate—the percentage change in the population over time. A country's population may grow during a year—for example, in 1985–90, the population of the United States increased by an annual average of 0.81 percent. In a few countries, the population is declining. For example, in 1985–90, in Italy there was an average annual loss of 0.03 percent.

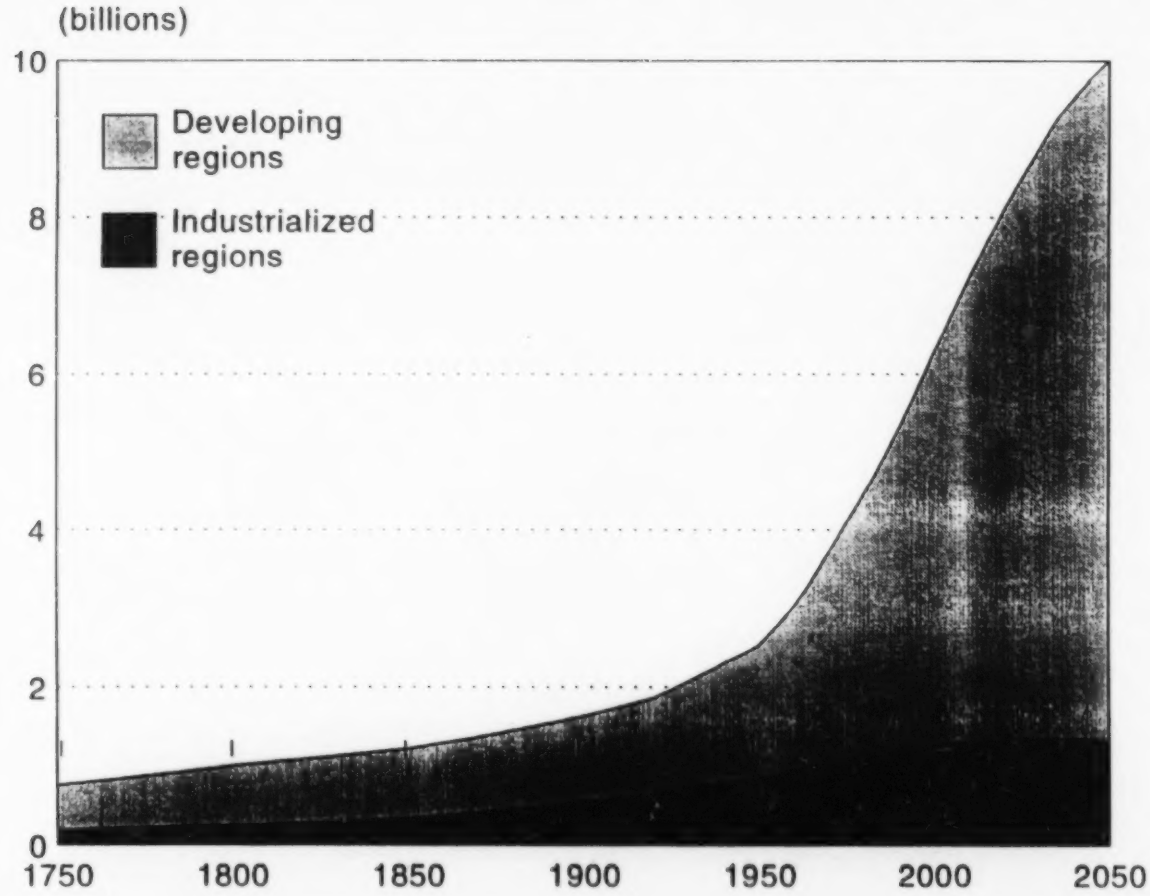
Causes of Soil Degradation



Source: L.R. Oldeman, V.W.P. van Engelen, and J.H.M. Pulles, "The Extent of Human-Induced Soil Degradation," Annex 5 of L.R. Oldeman, R.T.A. Hakkeling, and W.G. Sombroek, *World Map of the Status of Human-Induced Soil Degradation: An Explanatory Note*, rev. 2d ed. (International Soil Reference and Information Centre, Wageningen, the Netherlands, 1990), Figure 5.

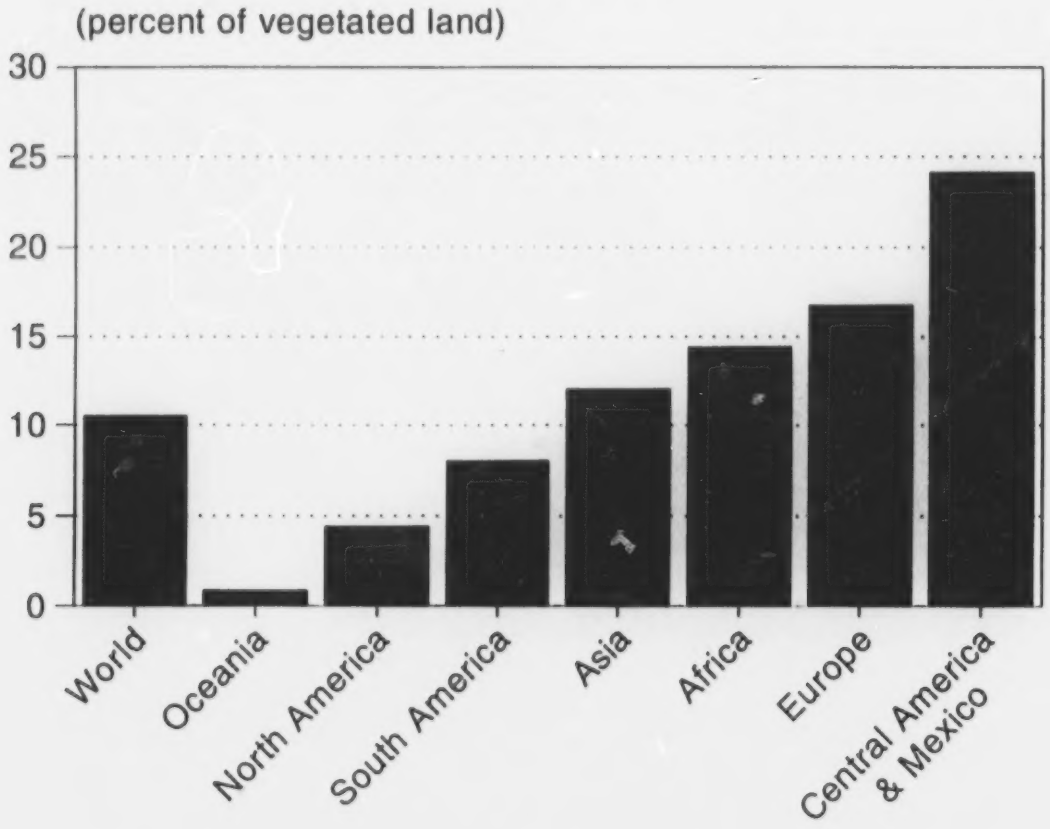
Notes: *Deforestation* is the removal of vegetation through agricultural clearing, logging, or development. *Overexploitation* is the removal of vegetation for fuelwood, fencing, etc. *Overgrazing* is when livestock eat vegetation and trample soil. *Agricultural activities* include using too much or not enough fertilizer, cultivating without preventing soil erosion, irrigating improperly, or using heavy machinery. *Industrialization* involves polluting soil with waste discharge, pesticides, and fertilizers. Categories not shown in regions represent less than one percent.

Trends and Projections in World Population Growth, 1750–2050



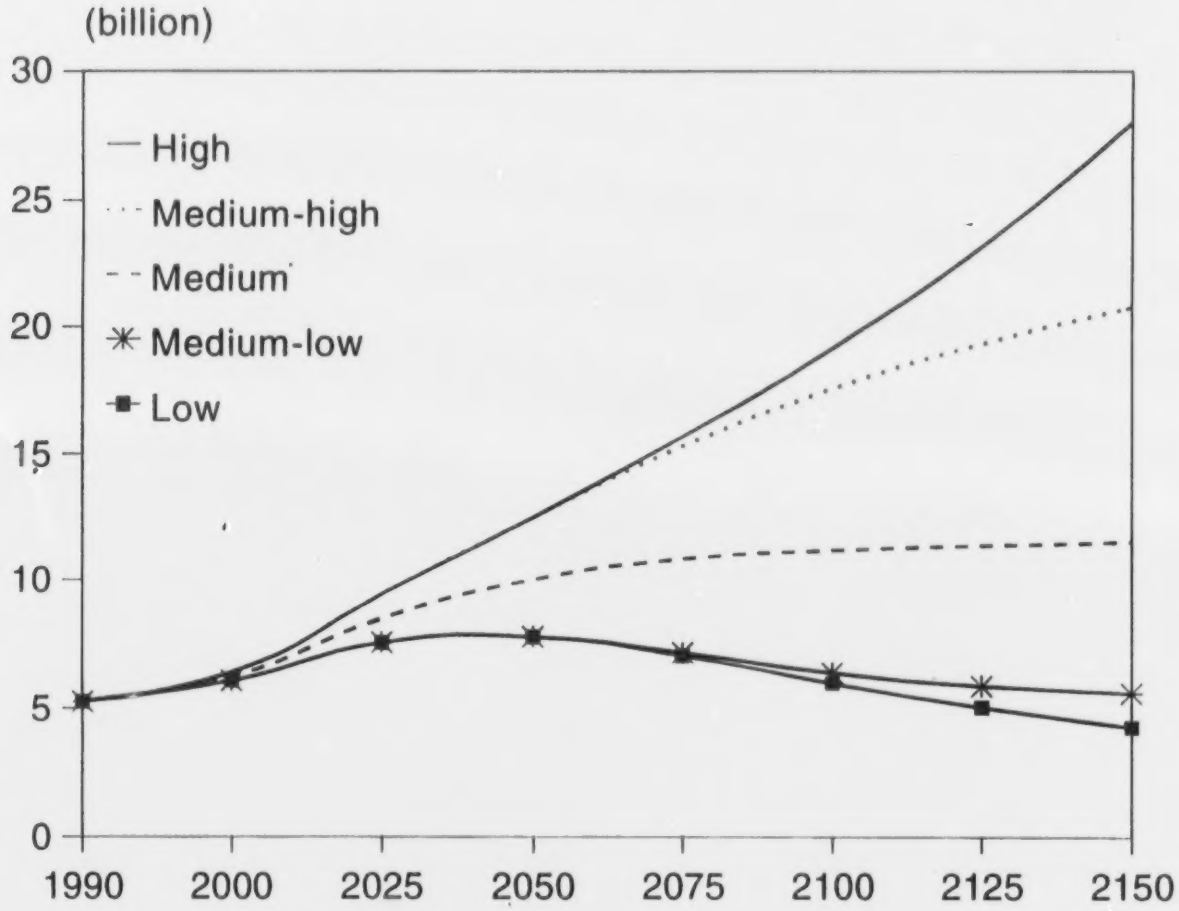
Sources: United Nations Population Division (UNPD), Long-Range World Population Projections: Two Centuries of World Population Growth, 1950–2150 (UN, New York, 1992); Carl Haub, Director of International Education, Population Reference Bureau, 1993 (personal communication)

Soil Degradation as a Percent of Vegetated Land, 1945–90



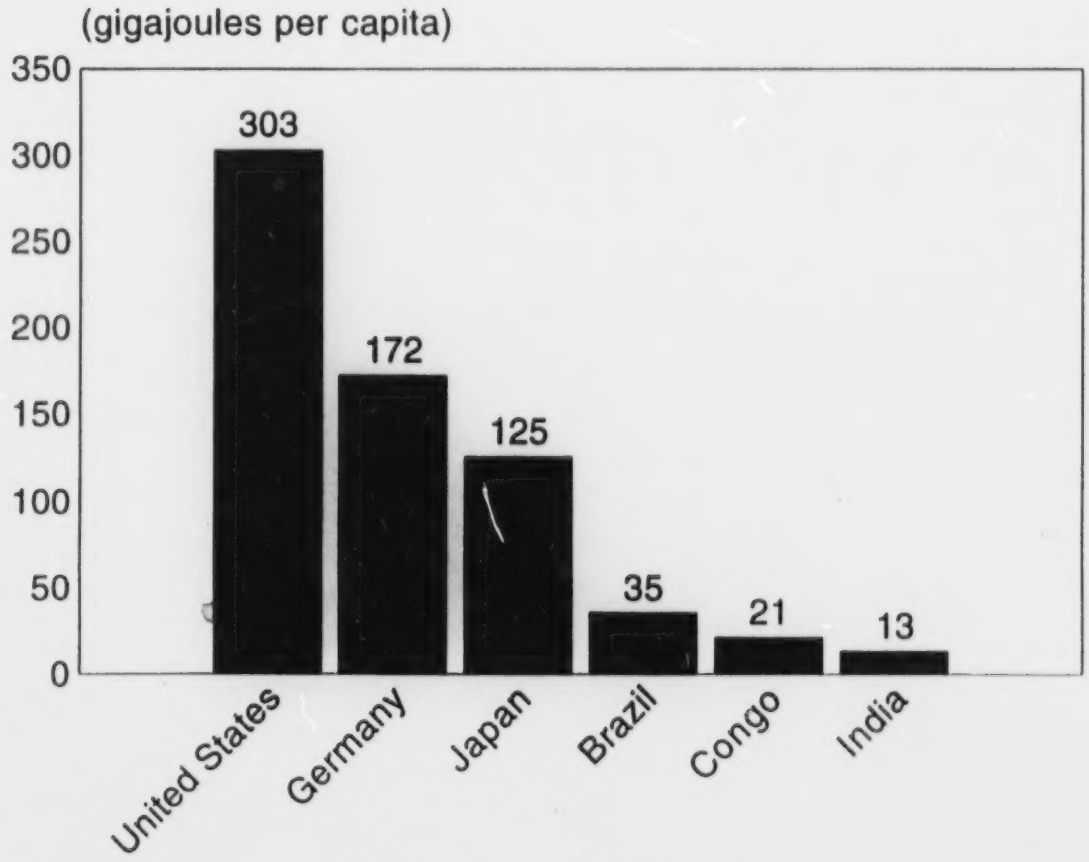
Source: World Resources Institute in collaboration with the United Nations Environment Programme and the United Nations Development Programme, *World Resources 1992–93* (Oxford University Press, New York, 1992), Table 8.1, p. 112.
Note: Degraded land is land that has lost some of its productive capacity due to erosion and overuse. Data for European and Asian parts of the former Soviet Union are included in Europe and Asia.

Projected Population of the World, 1990–2150



Source: United Nations Population Division, *Long-Range World Population Projections: Two Centuries of Population Growth, 1950–2150* (United Nations, New York, 1992), executive summary.

Energy Consumption Per Capita in Six Countries, 1991



Source: United Nations Statistical Division (UNSTAT), "UN Energy Tape" on diskette (UNSTAT, New York, 1992); United Nations Population Division (UNPD), "Interpolated National Populations (The 1992 Revision)" on diskette (UNPD, New York, 1992).

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Teacher's Survey
Teacher's Guide Units

(Please use additional paper if necessary)

1. Which *World Resources Teacher's Guide* unit did you use?

___1. Biodiversity
___2. Car Trouble
___3. Citizen Action
___4. Energy, Atmosphere, and Climate
___5. Natural Resource Economics
___6. Oceans and Coasts
___7. Population, Poverty, and Land Degradation
___8. Sustainable Development
___9. Two Giants: China and India
___10. Watershed Pollution
___11. Women, Equity, and Sustainable Development

2. Course(s) in which you used *World Resources Teacher's Guide* units?

___History ___Geography ___Science
___Ecology ___Biology ___Chemistry
___Environmental Studies ___Environmental Science ___Other

3. Which sections of the unit did you find most useful?

___Teaching Strategies
___Student Enrichment Activities
___Student Handouts
___Overhead Transparency Masters
___Reading and AV Lists

4. How much do you think you will use the *World Resources Teacher's Guide* units in the future?

___Often ___Occasionally ___Rarely

5. Did you use the Goals 2000 draft national performance standards to select material from the units?

___Yes ___No

6. If yes to the above question, which performance standards did you teach?_____

_____

7. Were the recommended activities in the unit useful in teaching those standards?

___Yes ___No

8. What features could be added to the *Teacher's Guide* to make it more useful to you?

_____

_____

_____

9. In what setting did you use the *Teacher's Guide* units?

___Middle school
___High School
___10th grade
___11th grade
___12th grade
___Community college
___College or university
___Adult education
___Nature center
___Zoo
___Museum
___Other

10. Was the material appropriate for your audience?

____Yes No, because_____

11. If you used the unit in a school, how much class time did you and your students spend on it?

____Less than 1 class ____2–3 classes ____1–2 weeks

____1 class ____4–5 classes ____More than 2 weeks

12. Do you regularly teach about global environmental issues?

____Yes ____No

13. If you don't regularly teach global environmental issues, did you find this unit offered enough information and materials to construct your lesson?

____Yes No, I also needed_____

14. Did you use other WRI materials with this unit?

____Yes ____No

If yes, which ones_____

15. Because new units of the *Teacher's Guide* are being developed, it is helpful for us to learn how the materials work. Did they engage your students? Prompt lively discussion? Help make what seemed abstract issues vivid? Please be specific with negative *or* positive comments.

_____

_____

_____

_____

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May we call you to discuss your suggestions?

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